Chapter Two
Risk Factors

About 5% to 10% of all people with diabetes have Type 1 diabetes. Type 2 diabetes represents the majority of cases of this disorder, accounting for about 90-95% of all people with diabetes. A family history of diabetes is more common in Type 2 than in Type 1. Major behavioral risk factors, such as overweight, physical inactivity and unhealthy diet, are partially responsible for development of Type 2 diabetes. Inadequate access to health care and sub-optimal diabetes management contribute to uncontrolled diabetes and diabetes complications.

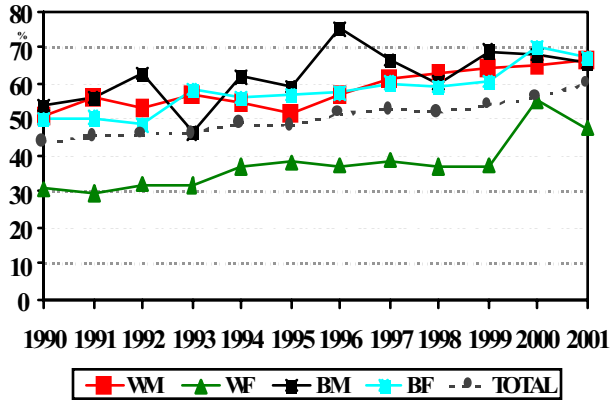
Risk Factors in the General Population

Overweight

Overweight (BMI ≥25 kg/m$^{2)}$ and obesity (BMI ≥30 kg/m$^{2)}$ are major risk factors of diabetes. More than 70% of people with Type 2 are overweight. Figure 11 presents the data from the BRFSS survey in 1990-2001. In South Carolina, nearly three out of five adult South Carolinians are overweight. In 2001, the prevalence was higher among blacks than whites, and higher among men than women.

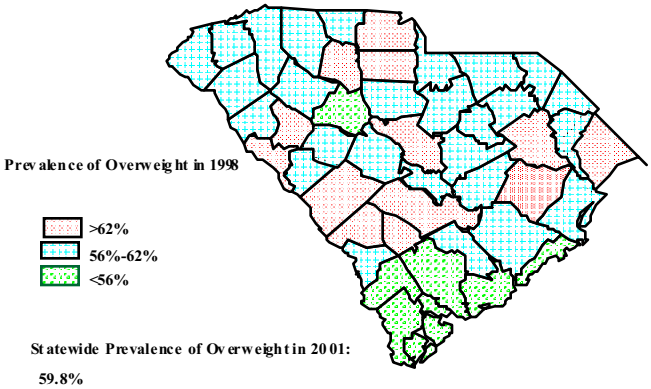
The prevalence of overweight in South Carolina adults increased by 54% from 39% in 1986 to 60% in 2001. The increases in prevalence of overweight varied among race-sex groups, from 33% among white men to an alarming 102% among white women during 1986-2001 (Figure 11).

Figure 11. Prevalence of Overweight among Adults by Race-Sex, SC, 1990-2001



According to the BRFSS survey, the statewide prevalence of overweight was 60% in 2001. Thirteen counties had a prevalence rate higher than the state average (>62%), and six counties, including five counties in the Low County and Trident Districts, had a prevalence rate lower than the state average (<56%). (Figure 12)

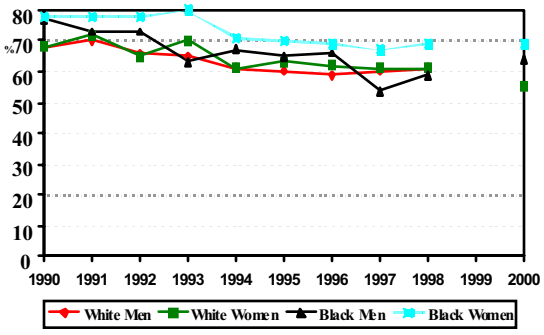
Figure 12. Prevalence of Overweight among Adults, SC, 2001



Physical Inactivity

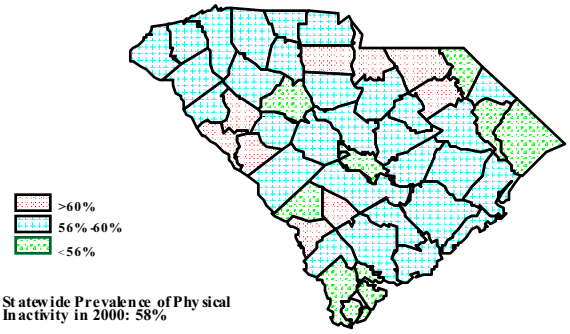
Regular physical activity reduces the risk of being overweight and promotes the body's expenditure of energy. Physical activity also reduces the risk of cardiovascular diseases, which are associated with diabetes. More than half South Carolina adults were physically inactive in 2000. Fifty-five percent of whites and 65% of blacks were physically inactive. Black women had the highest prevalence of physical inactivity (69%) among four race-sex groups. Figure 13 shows that during 1990-2000, the prevalence of physical inactivity decreased among all groups.

Figure 13. Prevalence of Physical Inactivity among Adults by Race-Sex, SC, 1990-2000



A majority of the counties in South Carolina had a prevalence of physical inactivity between 56% and 60%, which was similar to the state average (58%) in 2000. The prevalence of physical inactive was greater than 60% in nine counties. Eight counties had a prevalence rate lower than 56%. (Figure 14).

Figure 14. Prevalence of Physical Inactivity among Adult South Carolinians, 2000



Unhealthy Diet

The American Dietetic Association, the American Health Association, and the National Cancer Institute all recommend the consumption of at least five servings of fruits and vegetables a day (5-A-Day). Consuming fewer fruits and vegetables than recommended indicates an unhealthy diet that may lead to overweight. In 2000, three out of four adult South Carolinians consumed less than 5-A-Day. Men had a higher prevalence than women, and black men had the highest prevalence (81%) of consuming less than 5-A-Day among four race-sex groups in 2000. During 1990-2000, the prevalence rates fluctuated between 70% and 84%; however, the overall trend remained almost unchanged (Figure 15).

Figure 15. Prevalence of Consuming Fruits and Vegetables Fewer Than 5-A-Day among Adults by Race-Sex, SC, 1990-2000.

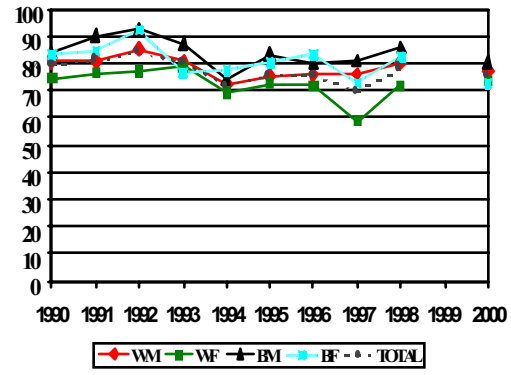
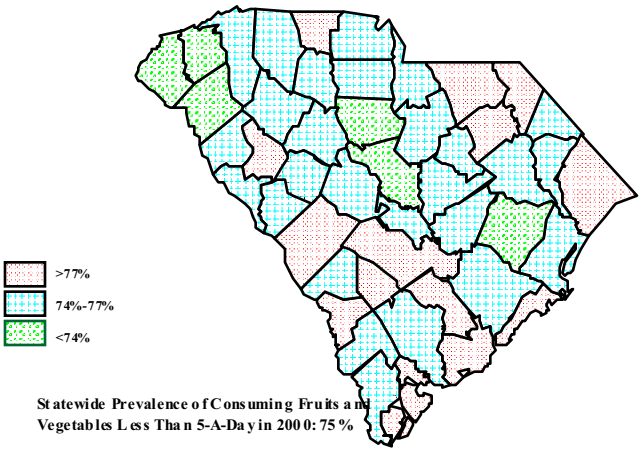


Figure 16 shows the prevalence of consuming less than 5-A-Day by county in South Carolina. No special pattern of prevalence of consuming fruits and vegetables less than 5-A-Day appears to occur by geographic distribution. Thirteen counties had a higher prevalence of consuming fruits and vegetables less than 5–A-Day than the state average (77%), while only six counties had a lower prevalence than the state average.

Figure 16. Prevalence of Consuming Fruits and Vegetables Less than 5-A-Day among Adults South Carolinians, 2000

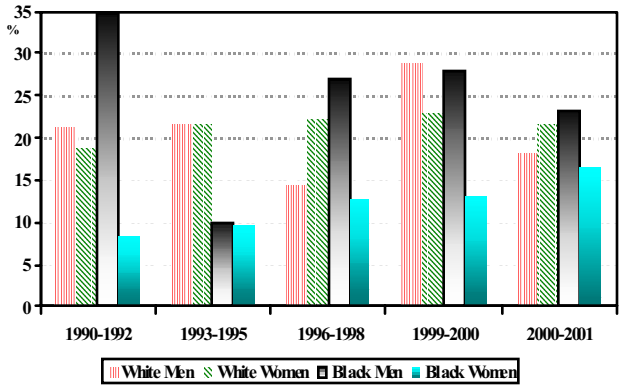


Cigarette Smoking

Although cigarette smoking is not a risk factor for diabetes, it increases the risk of diabetes related complications, especially for cardiovascular disease amputations, kidney disease and respiratory disease among people with diabetes. Overall, people with diabetes had a lower prevalence (16%-23%) of cigarette smoking than general population (26%) in 2000-2001.

Among people with diabetes, black men had the highest prevalence (23%) of cigarette smoking, while black women had the lowest prevalence (16%) among four race-sex groups (Figure 17). The prevalence of cigarette smoking among people with diabetes increased by 18% among white men, 34% among white women and 30% among black women during 1987-2001. An encouraging trend is that the prevalence decreased by 33% among black men in the same time period.

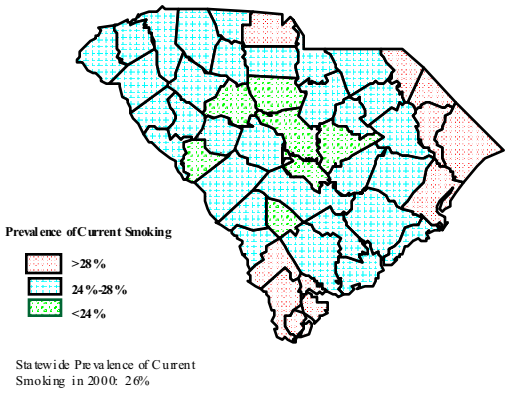
Figure 17. Prevalence of Current Cigarette Smoking among Adults with Diabetes by Race-Sex, SC, 1990-2001



The overall prevalence of cigarette smoking in South Carolina was 26% in 2001. Figure 18 presents counties in three categories: counties with prevalence higher than state average, counties with prevalence similar to the state average, and counties with prevalence lower than the state average. There were nine counties with the prevalence of cigarette smoking greater than 28%. The counties with a high prevalence mainly are located in the eastern counties

(Pee Dee and Waccamaw) and the southern (Low County). Counties that have the prevalence lower than 24% were mainly those that are located in the center of the state (Midland and Wateree) in 2000.

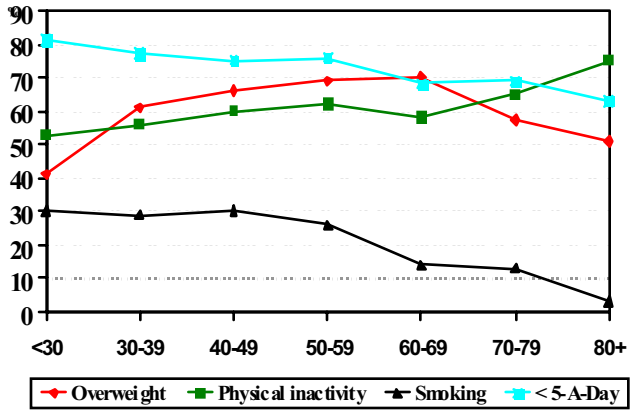
Figure 18. Prevalence of Current Cigarette Smoking among Adults, SC, 2001



Age-Specific Prevalence of Major Behavioral Risk Factors among Adults

Figure 19 presents age-specific prevalence of four risk behavioral risk factors: overweight, physical inactivity, consuming fruits and vegetables less than 5-A-Day, and cigarette smoking. Young adults (under 30 years of age) have the highest prevalence of smoking, and the highest prevalence of consuming fruits and vegetables less than 5-A-Day, but the lowest prevalence of overweight, and the lowest prevalence of physical inactivity among all age groups. Middle age adults (age between age 30 and 70) have an increasing prevalence of overweight and physical inactivity by age, but a decreasing prevalence of consuming fruits and vegetables less than 5-A-Day and cigarette smoking by age. Old adults (age 70 years and older) have the lowest prevalence of smoking and the lowest prevalence of consuming fruits and vegetables less than 5-a-Day, but have the highest prevalence of physical inactivity among all age groups.

Figure 19. Age-Specific Prevalence of Major Behavioral Risk Factors among Adults, SC, 2000



Hypertension and High Cholesterol

Control of hypertension and high cholesterol are important ways to prevent diabetes related complications. People with diabetes are more likely to have hypertension and high cholesterol than people without diabetes. In 2000-2001, nearly two-thirds of people with diabetes had hypertension, while only one-fourth for people without diabetes had hypertension. Almost four out of five (83%) black women with diabetes had hypertension, a prevalence that was the highest among race-gender groups. Compared with the data of the BRFSS in 1994-1997, the prevalence of hypertension among people with diabetes increased among white men, white women and black women, but decreased among black men. (Table 4)

Table 4. Prevalence of Hypertension in South Carolina, 1994-1997 and 2000-2001

	1994-1997		2000-2001	
	People with Diabetes	People without Diabetes	People with Diabetes	People without Diabetes
White Men	40.7	19.4	66.1	23.4
White Women	57.1	22.7	63.6	23.5
Nonwhite Men	69.5	26.0	59.0	26.5
Nonwhite Women	74.8	30.3	82.8	30.0

Nearly half of people with diabetes have high cholesterol. Table 5 shows that the prevalence of having high cholesterol among people with diabetes was 63%-140% higher than that among people without diabetes. White men with diabetes had the highest prevalence (55%) of having high cholesterol among all race-sex groups in 2000-2001. Compared to the data in 1994-1997, the prevalence of having high cholesterol in 2000-2001 increased among white men with diabetes.

Table 5. Prevalence of High Cholesterol in South Carolina 1994-1997 and 2000-2001

	1994-1997		2000-2001	
	People with Diabetes	People without Diabetes	People with Diabetes	People without Diabetes
White Men	34.7	24.3	55.2	23.4
White Women	45.3	27.4	44.5	25.6
Nonwhite Men	36.5	19.3	31.5	19.3
Nonwhite Women	45.3	25.3	45.3	18.8

Control of Diabetes with Insulin or Diabetes Pills

BRFSS surveyed the means of control of diabetes, using either insulin or diabetes pills, among people with diabetes. Diabetes pills are used more often than insulin among people with diabetes. Approximately two-thirds of people with diabetes take diabetes pills. The prevalence of using insulin to control glucose level among blacks was almost twice that among whites (Figure 20).

Figure 20. Prevalence of Taking Insulin or Diabetes Pills Among People with Diabetes, SC, 2000-2001.

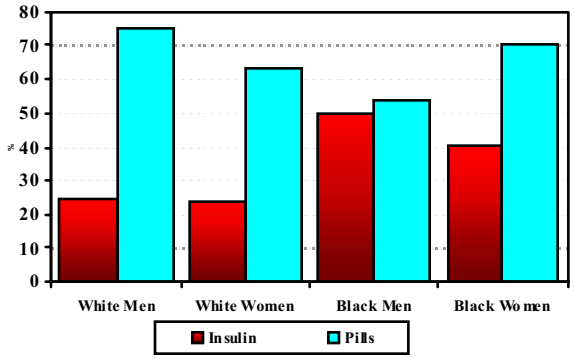


Figure 21 illustrates the prevalence of using of insulin or diabetes pill by age groups. Insulin was almost equally used among all age groups. However, the prevalence of using diabetes pills increased with patient's age, and reached a peak of 77% among people age between 55 and 64.

Figure 21. Prevalence of Taking Insulin and Diabetes Pills by Age among People with Diabetes, SC, 2000-2001.

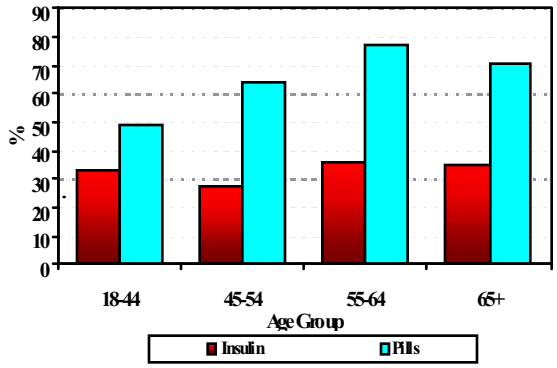
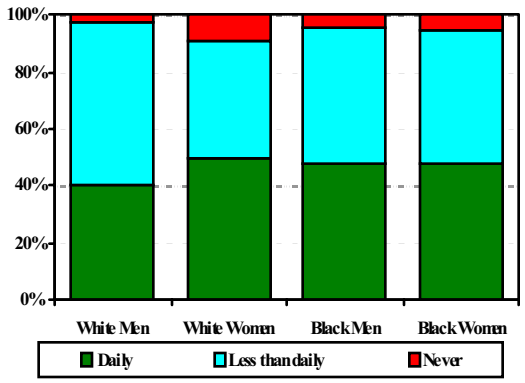


Figure 22. Prevalence of Having Blood Glucose Checked among People with Diabetes by Race, Sex, SC, 2000-2001.



Regularly Checking Blood Glucose

Regularly monitoring blood glucose level is the foundation of appropriate management of diabetes. Figure 22 shows that although approximately 95% of people with diabetes checked their blood glucose level, less than half did so daily. This is still a marked improvement over 1994-97 when only 5% of diabetics checked their blood glucose one to four times daily. White men had the lowest prevalence (40%) of checking glucose on daily basis among race-sex groups.

Many people with diabetes who had their glucose checked, monitored their glucose level less than once a day. The prevalence of having glucose checked less than once a day ranged from the highest rate of 57% among white men to the lowest rate of 42% among white women. It is worthwhile to notice that many women, especially white women (8%) reported they never had their glucose checked. While there is room for further improvement in these measures, frequency of blood glucose monitoring has improved significantly since 1994-97 (previous Burden Report).

Checking HbA1C

Hemoglobin A1c (HbA1c) or glycosylated hemoglobin is a recommended measure of average blood glucose level in the past 2-3 months. The American Diabetes Association recommends that people with diabetes should have their HbA1c checked every three months for monitoring long-term glucose control. In 2000-2001, more than 70% of people with diabetes had at least two HbA1c tests in the past year (Figure 23). This is a marked improvement since 1994-97, when only 25% had ever heard of A1C.

Black men had the lowest prevalence (67%) of having at least two HbA1c among race-gender groups. Another 12%-19% of people with diabetes reported having only one HbA1c test in the past year. Nearly 10% of people with diabetes, including 16% of black men, 14% of black women, 9% of white men and 7% of white women, reported having no HbA1c test in the past year.

Figure 23. Prevalence of Having HbA1c Checked by Number Tests among People with Diabetes, SC, 2000-2001

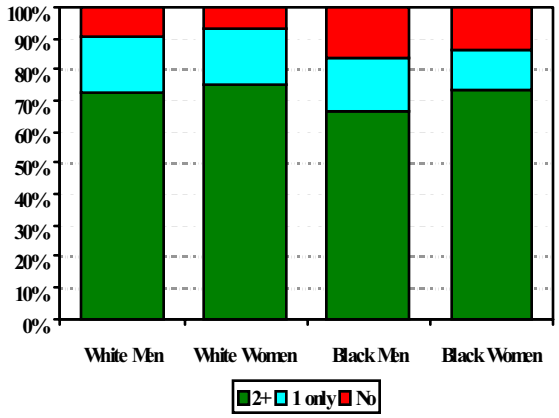
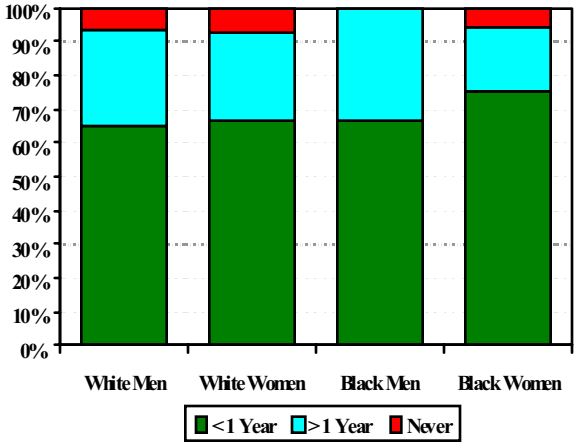


Figure 24. Prevalence of Having Eyes Examined among People with Diabetes by Race-Sex, SC, 2000-2001.

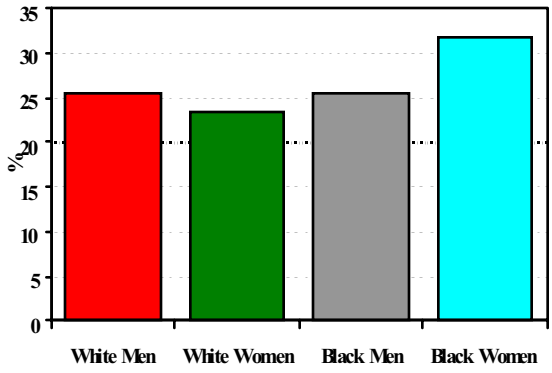


Eye Examination

The diabetes standard of care guideline issued by the American Diabetes Association recommends an annual dilated eye exam by an eye care specialist to detect early signs of retinopathy and start appropriate treatment. Figure 24 shows that more than two-thirds (68%) of people with diabetes reported having their eyes examined in the past year. The prevalence of having eyes examined in the past year was the highest among black women (76%) among four race-sex groups. Twenty-seven percent of people with diabetes reported having their eyes examined a year ago. Approximately 5% of people with diabetes reported never having their eyes examined. Among those, women had a higher prevalence than men, and white women had the highest prevalence (7%) in all race-sex groups.

According to the BRFSS survey in 2000-2001, approximately one quarter of people with diabetes reported that their eyes were affected by diabetes. Among people with diabetes, black women had the highest prevalence (32%) of eyes being affected by diabetes, while white women had the lowest prevalence (23%) among race-sex groups. These data on eye examinations are comparable to the last Burden Report results (Figure 25).

Figure 25. Prevalence of Eyes Being Affected by Diabetes among People with Diabetes, SC, 2000-2001.

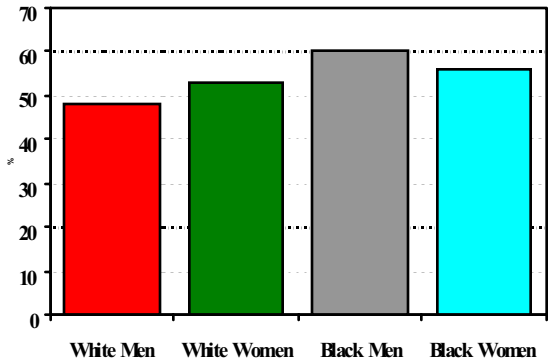


Diabetes Patient Education

Diabetes patient education for self-management of diabetes is an integral

component of diabetes care and management. The goal of diabetes self-management education is to enable people with diabetes to become active participants in their diabetes care and treatment. Among people with diabetes, approximately half had taken a course for management diabetes in 2000-2001. The prevalence of having taken a course was higher among blacks, especially black men (60%), than among whites (Figure 26).

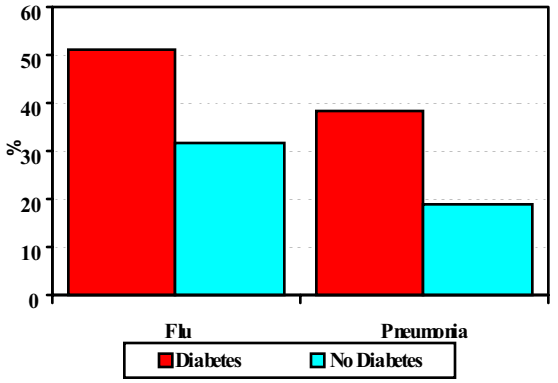
Figure 26. Prevalence of Having Taken a Course for Managing Diabetes among People with Diabetes, SC, 2000-2001.



Flu and Pneumonia Vaccinations

Flu vaccination and pneumonia vaccination are recommended for people with diabetes to prevent respiratory infections. According to the 2000-2001 BRFSS survey, the prevalence of receiving flu vaccination and pneumonia vaccination were significantly higher among people with diabetes than among people without diabetes. However, there was still a great deal of people with diabetes who did not receive flu vaccination (49%) or pneumonia vaccination (63%) in 2000-2001 (Figure 27).

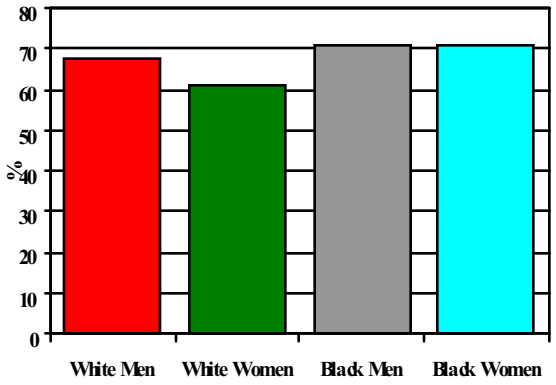
Figure 27. Prevalence of Receiving Flu Shot in Past 12 Months and Ever Received Pneumonia Vaccine among People with Diabetes, SC, 2000-2001.



Foot Examination by a Health Professional

Standard diabetes care recommended by the American Diabetes Association also includes foot examination at each medical visit. Figure 28 shows that approximately two-thirds of people with diabetes had their feet checked by a health professional. The prevalence of having their feet checked was 71% for both black men and black women, which was higher than that among white women (61%) and white men (68%) (Figure 28).

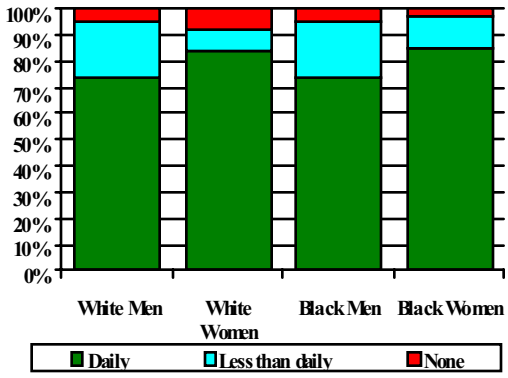
Figure 28. Prevalence of Having Feet Checked by a Health Professional in the Last Year among People with Diabetes, SC, 2000-2001.



Self-Checking Feet for Sores or Irritations

Approximately 94% of people with diabetes reported self-checking feet for sores and irritations in 2000-2001. More than three quarters of people with diabetes checked their feet daily for sores and irritations. More women (84%) checked their feet daily than did men (74%). However, approximately 6% of people with diabetes had never checked their feet for sores and irritations by themselves (Figure 29).

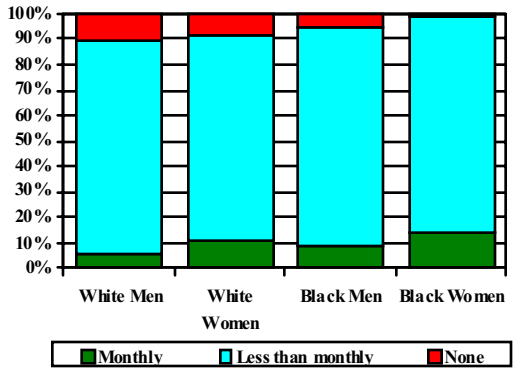
Figure 29. Prevalence of Self-Checking Feet for Sores or Irritations among People with Diabetes, SC, 2000-2001.



Seeing a Health Professional for Diabetes in the Past Year

More than 90% of diabetes reported having seen a health professional for diabetes in the past year, according to the BRFSS survey in 2000-2001. More women visited a health professional for diabetes monthly than did men. There were, however, approximately 10% of whites with diabetes and 5% of black men with diabetes who did not see a health professional in the past year. Among blacks there was marked improvement from 15% BM to 22% BF since the previous Burden Report (1994-97) (Figure 30).

Figure 30. Prevalence of Seeing a Health Professional for Diabetes in Past Year, SC, 2000-2001.



Summary

The major findings in the serial BRFSS analyses have been an alarming increase in diabetic individuals who are overweight or obese, and who have high blood cholesterol and hypertension. These are clearly areas to target in future programs directed toward improving cardiovascular morbidity and mortality in people with diabetes, and improving primary prevention efforts.

Overall, there has been improvement in areas of knowledge of diabetes and access to prevention and intervention services. Short-term surrogate measures and actions such as HbA1c tests, foot examinations, and eye

examinations have been improved in recent years. Continued efforts should emphasize major behavioral risk factor modification, racial and gender disparities in self-blood glucose monitoring, standards of care, accessibility, and affordability of care. Optimal management and treatment of diabetes and prevention of diabetes complications are a high priority of the continued efforts of the SCDHEC DPCP and the DSC.